GRIZZLY BEAR HABITAT OF THE FLATHEAD RIVER AREA: EXPANDED LEGEND

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by

E.C. (Ted) Lea
Brian L. Fuhr
Larry E.H. Lacelle

Habitat Inventory Section
Wildlife Branch
Victoria, B.C.

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CHAPTER 1. INTRODUCTION

1.1 Background

This report describes and rates grizzly bear habitat in the Flathead River Valley of southwestern British Columbia (Figure 1). This area is mapped at a scale of 1:50 000, and includes portions of National Topographic Series (N.T.S.) 82G/1 and 82G/2. The study was used as a pilot area to develop a method for mapping habitat and estimating carrying capacity for grizzly bears (Fuhr 1987). Biophysical habitat mapping (Demarchi *et al.*, in prep.), was used to rate the area for bears. Habitats and grizzly bear carrying capacity are shown on the same map. This report and map provide information on the present and potential vegetation within the study area. These can aid in determining habitat protection and enhancement opportunities for bear habitat.

1.2 Methods

Soils, terrain, vegetation and grizzly bear habitat were assessed in the field, in September, 1986. One hundred and seven sites were sampled, covering variation of grizzly bear use and vegetation on various kinds of sites and soils. As well, 25 plots from the Ministry of Forests, Research Section in Nelson and 25 plots from a previous Ministry of Environment study (Lea 1984) were used to describe habitat units. Alpine areas were not sampled due to early snowfall.

1.3 Classification

Biophysical habitat mapping methods, outlined in Demarchi *et al.* (in prep.), were used to delineate grizzly bear habitat. This system has a hierarchy of three mapping levels: Ecoregions, Biogeoclimatic Units and Biophysical Habitat Units. *Ecoregions* are broad ecological units for the province based on climatic processes, physiography, and broad animal and plant distribution (Demarchi 1988). *Biogeoclimatic Units*, as mapped by the British Columbia Ministry of Forests, provide a climatic framework for mapping within each Ecoregion, as well as a framework for mapping plant community distribution. Biogeoclimatic Subzones are used in this study. They are areas characterized by a distinct climatic climax or zonal ecosystem association (Utzig *et al.*, 1983). A subzone consists of a unique sequence of geographically related ecosystems influenced by one type of regional climate. The Ecoregions and Biogeoclimatic Subzones of the East Kootenay have recently been mapped at a scale of 1:500 000 (Fenger *et al.* 1988).

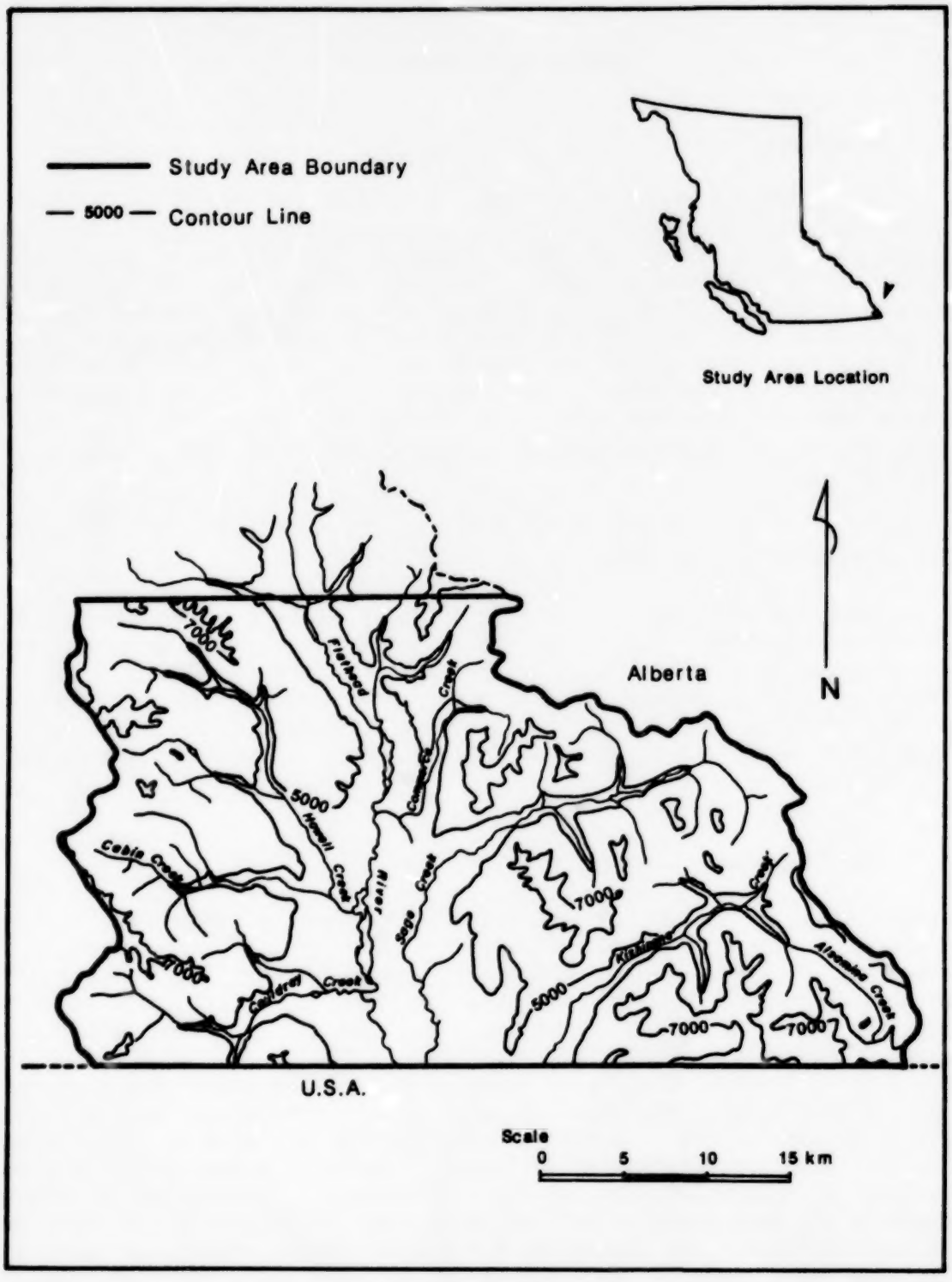

Figure 1. Location of the Flathead study area.

Biophysical Habitat Units are ecological units that are relatively homogeneous for soils, surficial material, bedrock geology, climate, topography, successional trends of vegetation and potential animal use. These units are divided into successional stages for forested areas. These units were defined in this study with special attention to grizzly bear habitat. Considerable ecological information existed prior to the present study which was used to aid habitat classification. This included information on wildlife (Demarchi 1986), which places the wildlife resources of the Flathead Valley in a regional context. A comparable report by Lacelie (in prep.) describes the soils of this region. Existing terrain mapping (Ryder 1981) was revised as a base for mapping habitat units in the present project.

CHAPTER 2. DESCRIPTION OF MAP UNITS

2.1 Ecoregions

Five levels of Ecoregion are defined for the province. These include Ecodomain, Ecodivision, Ecoprovince, Ecoregion and Ecosection (Demarchi 1988). These subdivisions put the study area in a provincial context, but do not provide subdivisions within the study area because of their general nature. The study area is within the:

Humid Temperate Ecodomain
Humid Continental Highlands Ecodivision
Southern Interior Mountains Ecoprovince
Southern Rocky Mountains Ecoregion
Southern Continental Ranges Ecosection (SCR)

The Southern Continental Ranges Ecosection is the drier, mountainous portion of the Southern Rocky Mountains Ecoregion.

2.2 Biogeoclimatic Subzones

Three Biogeoclimatic Zones, represented by one Subzone each, are present in the study area (Table 2.1).

2.3 Grizzly Bear Rating and Habitat Units (after Fuhr 1987)

Example of Map Symbol

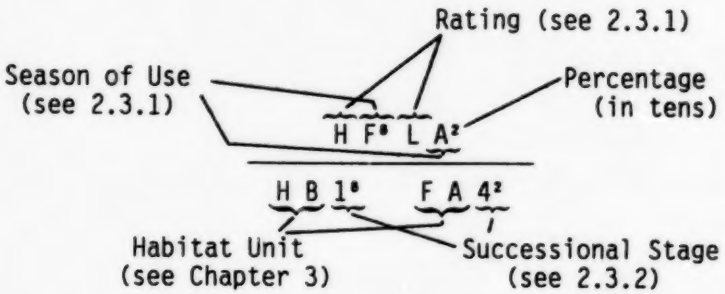

Table 2.1 Biogeoclimatic Subzones

Map Symbol	Subzone	Description
SCR / MSa	Dry, Cordilleran Montane Spruce (MSa)	This subzone is characterized by having climatic climax forests of spruce and subalpine fir. The understory consists of red twinberry, birch-leaved spirea, twinflower and red-stemmed feather moss. Seral forests are dominated by lodgepole pine and western larch, with an understory of pinegrass and soopolallie. Most of the broad, Flathead River Valley is within this subzone. Soils are moderately well leached and are usually Eutric Brunisols.
SCR / ESSFa	Dry, Southern, Cordilleran, Forested Engelmann Spruce - Subalpine Fir (ESSFa)	This subzone is characterized by having climatic climax forests of Engelmann spruce and subalpine fir with an understory of false azalea, grouseberry, queen's cup, bunchberry and red-stemmed feather moss. Seral forests are dominated by lodgepole pine with whitebark pine and Douglas-fir. Most of the mountainous areas of the Flathead River Valley are within this subzone. Higher precipitation causes deeper leached soils.
SCR / ATf	Dry, Southern Cordilleran Alpine Tundra (ATf)	The alpine zone is treeless although tree species may occur in a stunted, krummholz form. Vegetation is dominated by grasses, herbs, low shrubs, mosses and lichens. In the study area the alpine is very sparsely vegetated and is dominated by rock.

2.3.1 Grizzly Bear Carrying Capacity Estimates and Season of Use

Carrying Capacity Estimates are applied to the total area of the habitat available by season and not on an individual polygon basis (Fuhr 1987).

Map Symbol	Rating	Carrying Capacity Estimate
H	High	5 km²/grizzly bear
M	Moderate	15 km²/grizzly bear
L	Low	45 km²/grizzly bear

Season of Use Categories

Map Symbol	Season	Definition
Sp	Spring	from time of emergence from dens to full leaf flush.
S	Summer	from full leaf flush to berry ripening.
F	Fall	from berry ripening to time of denning.
W	Winter	denning.
A	Annual	the active season, excluding denning.

2.3.2 Successional Stages

All forested habitat units are mapped for the following stages:

1 Shrub/Herb
2 Pole/Sapling - less than 20 years
3 Young Forests - 20 to 80 years
4 Mature Forests - over 80 years

CHAPTER 3. HABITAT UNITS OF THE FLATHEAD STUDY AREA

The following are the descriptions for Habitat Units mapped.

3.1 MSa - Dry, Cordilleran Montane Spruce Subzone.

Habitat Unit Name and Symbol[1]	Physical Description	Vegetation		Grizzly Bear Use	Comments
		Successional Trends	Forage Potential		
1. AH Sitka alder - Indian hellebore avalanche chute	subject to frequent snow avalanche and nutrient rich seepage water; usually found on northern or eastern aspects; large catchment areas often provide increased moisture for lower slopes.	dense shrub-forb cover of Sitka alder, mountain-ash, thimbleberry, Indian hellebore, fairybells, baneberry. gently sloping runout areas may have a lush forb-grass meadow of gooseberries, grasses, fireweed, meadow-rue, asters, cow-parsnip, angelica, bear-grass.	grasses H mountain-ash H red elderberry H cow-parsnip H angelica L-H	HA	this unit has abundant grizzly bear forage, particularly on the moister lower slopes of the unit. The meadows of these lower slope areas have variable amounts of bear forage including red elderberry, red raspberry, mountain-ash, sedges, alder-leaved buckthorn and black twinberry; the steep part of this unit may have small amounts of bear forage including red raspberry, black twinberry, grasses, sweet-cicely, glacier lily and springbeauty.
2. GB Gravel bars	active floodplain gravel bars; underwater for part of the year.	sparsely vegetated by willows and herbs	very low	LSp	common along the Flathead River.
3. GF Grassy fields	low, level, fluvial terraces above the Flathead River subject to droughtly conditions in the summer.	grass dominated cover of timothy, wheatgrass, blue grass, snowberry	grasses H alder-leaved buckthorn L soopolallie L	LSp	- low forage availability (other than grass) - not thought to be frequently used but disturbance and domestic grazing may limit use

MSa - Dry, Cordilleran Montane Spruce Subzone (continued)

Habitat Unit Name and Symbol[1]	Physical Description	Vegetation		Grizzly Bear Use	Comments
		Successional Trends	Forage Potential		
4. LF Lodgepole pine - falsebox southerly aspect LF1	moderately steep, of southeast to west facing slopes; deep to shallow soils developed from colluvial or morainal materials; well to rapidly drained, droughty soils	shrub-herb cover of soopolallie, birch-leaved spirea, falsebox, thimbleberry, wild strawberry, fireweed	soopolallie M-H wild strawberry L-M black huckleberry L	MSpF	- black huckleberry may occur at upper elevations of this unit; slow rate of succession; - low moisture availability - American vetch and kinnikinnick may be present in small amounts - snowbrush may occur in early stages of succession
LF2		pole-sapling open forests of lodgepole pine, birch-leaved spirea, soopolallie, falsebox, thimbleberry, wild strawberry, pinegrass	soopolallie M wild strawberry L-M black huckleberry L	MSpF	
LF3		young, open to closed forests of lodgepole pine, Douglas-fir, birch-leaved spirea, falsebox, thimbleberry, pinegrass, showy aster	tree bark M	LSp	
LF4		mature forests of spruce, subalpine fir, birch-leaved spirea, falsebox, showy aster, twinflower.	tree bark M	LSp	

MSa - Dry, Cordilleran Montane Spruce Subzone (continued)

Habitat Unit Name and Symbol[1]	Physical Description	Vegetation		Grizzly Bear Use	Comments
		Successional Trends	Forage Potential		
5. LH Lodgepole pine - pinegrass moraine LH1	gentle to moderately sloping sites found on deep deposits of moraine or colluvial materials; average moisture conditions	shrub-herb cover of soopolallie, pinegrass, dwarf blueberry, wild strawberry, arctic lupine, fireweed	soopolallie M-H wild strawberry L-M	MF	forage species that occur inconsistently include sulphur hedysarum, glacier lily, American vetch, kinnikinnick, sweet-cicely, creamy peavine; sulphur hedysarum occurs in patches, probably due to its heavy seeds which spread slowly; soopolallie and blueberries produce abundant berries only in earlier stages of succession; thimbleberry may be abundant in side valleys of the Flathead drainage; blueberries found in this unit include dwarf blueberry, low bilberry, grouseberry and black huckleberry; soopolallie is less abundant in the lower Flathead Valley.
LH2		pole-sapling forests of lodgepole pine, soopolallie, birch-leaved spirea, pinegrass, blueberries, arnicas, showy aster	soopolallie M blueberries L-M	MF	
LH3		young forests of lodgepole pine, soopolallie, birch-leaved spirea, pinegrass, blueberries, arnicas, showy aster	nil	LF	
LH4		mature forests of spruce, subalpine fir, birch-leaved spirea, twinflower, blueberries, arnicas, showy aster, common moss	nil	LF	

MSa - Dry, Cordilleran Montane Spruce Subzone (continued)

Habitat Unit Name and Symbol[1]	Physical Description	Vegetation		Grizzly Bear Use	Comments
		Successional Trends	Forage Potential		
6. LP Lodgepole pine - pinegrass coarse fluvial LP1	sandy or gravelly fluvial materials usually on gently to moderately sloping areas; low moisture availability due to well to rapid soil drainage.	shrub-herb cover of soopolallie, pinegrass, fireweed, arctic lupine, wild strawberry,	soopolallie M-H small amounts of various species	MSpF	usually closely associated with major floodplains, which increases spring and fall bear use. seral forests are sometimes dominated by or have a major component of western larch; forage species that occur inconsistently include sulphur hedysarum, American vetch, wild strawberry, kinnikinnick, sweet-cicely; sulphur hedysarum occurs in patches, probably due to its heavy seeds which spread slowly; slow rate of succession particularly to spruce and subalpine fir; soopolallie produces abundant berries only in earlier stages of succession; soopolallie is less abundant in the lower Flathead Valley.
LP2		pole-sapling open forests of lodgepole pine, birch-leaved spirea, soopolallie, pinegrass, twinflower, dwarf blueberry, grouseberry	soopolallie M small amounts of various species	LSpF	
LP3		young forests of lodgepole pine, spruce, birch-leaved spirea, soopolallie, pinegrass, twinflower, dwarf blueberry, grouseberry	small amounts of various species	LSpF	
LP4		mature forests of spruce, subalpine fir, birch-leaved spirea, twinflower, dwarf blueberry, grouseberry, common moss	very little	LSpF	
7. RO Rock	areas of bedrock or talus	sparsely vegetated areas with pioneering vegetation	nil	N	

MSa - Dry, Cordilleran Montane Spruce Subzone (continued)

Habitat Unit Name and Symbol[1]	Physical Description	Vegetation		Grizzly Bear Use	Comments
		Successional Trends	Forage Potential		
8. SH Spruce - horsetail moist floodplain SH1	low terraces of creeks and rivers subject to moist conditions with rare flooding; moderately well to imperfectly drained soils developed from fluvial materials; may include areas of seepage other than floodplains.	lush shrub-herb cover of alder, black twinberry, black gooseberry, horsetails, western meadow-rue, grasses	grasses M horsetails H black twinberry L-M cow-parsnip M angelica L-M sedges L	HSpS	variable unit; forage species which may be present in small amounts include mountain-ash, red elderberry, hawthorn, alder-leaved buckthorn, red raspberry, soopolallie, highbush-cranberry, wild strawberry, sweet-cicely, vetch and peavine; mature forests may have sparse understories; red-osier dogwood is frequently found in these units; severe disturbance may create grass dominated areas; the SH1 stage may be very sparsely vegetated on the more active floodplain portions of the Flathead River
SH2		pole-sapling forest of spruce, black twinberry, black gooseberry, horsetails, western meadow-rue, grasses	horsetails H grasses M black twinberry L-M cow-parsnip M angelica L sedges L	HSpS	
SH3		young forests of spruce, black twinberry, black gooseberry, horsetails, western meadow-rue, grasses	tree bark H horsetails M black twinberry L-M cow-parsnip L-M grasses L-M angelica L sedges L	HSpS	
SH4		mature forests of spruce, black twinberry, black gooseberry, horsetails, western meadow-rue, grasses	tree bark H horsetails M black twinberry L-M cow-parsnip L-M grasses L angelica L sedges L	HSpS	

MSa - Dry, Cordilleran Montane Spruce Subzone (continued)

Habitat Unit Name and Symbol[1]	Physical Description	Vegetation		Grizzly Bear Use	Comments
		Successional Trends	Forage Potential		
9. SS Saskatoon - wild strawberry dry avalanche chute	steep sloped areas subject to snow avalanching in winter; usually on southerly and westerly aspects; usually shallow soils with rock outcrops	disturbance climax of sparse shrub-dominated vegetation of trembling aspen, willows, saskatoon, wild strawberry, asters	wild strawberry M grasses M saskatoon L-M	MSpF	quite variable vegetation; generally drier and less productive for forage than AH. The steeper portions may have sporadic occurrences of the following forage species: black huckleberry, soopolallie, alder-leaved buckthorn and grasses; the base of the chutes may have black twinberry mountain-ash, red elderberry and angelica; upper areas of these chutes may have good black huckleberry production; the shrub and herb layers of this unit are usually sparse.
10. WC Willow - cow-parsnip active floodplain	floodplains of rivers and creeks subject to frequent flooding and a high water table for much of the year	lush shrub-forb cover of willows, mountain alder, twinberry, honeysuckle, red-osier dogwood, cow-parsnip, horsetails, grasses, asters	grasses H cow-parsnip H horsetails M black twinberry L-M alder-leaved buckthorn L-M angelica L-M sedges L-M	HSpS	very high forage production for grizzly bears, variable units; forage species which may be present in small amounts include red raspberry, red elderberry, highbush-cranberry, peavine, vetch and wild strawberry.
11. WS Willow - sedge fen	depressional areas with organic deposits; high water table much of growing season	fen vegetation of willows, sedges, moss	sedges H	HSpS	willows may be absent; associated sites may have horsetails, angelica, black twinberry and alder-leaved buckthorn.

3.2 ESSFa - Dry Southern, Cordilleran, Forested Engelmann Spruce - Subalpine Fir

Habitat Unit Name and Symbol	Physical Description	Vegetation		Grizzly Bear Use	Comments
		Successional Trends	Forage Potential		
1. AH Sitka alder - Indian hellebore avalanche chute	subject to frequent snow avalanche and nutrient rich seepage water; usually found on northern or eastern aspects; gentle run out area may be very moist and nutrient rich.	dense shrub-forb cover of Sitka alder, mountain-ash, thimbleberry, Indian hellebore, fairyballs, baneberry. lush forb-grass meadow of gooseberries, grasses, fireweed, meadow-rue, asters, cow-parsnip, angelica, bear-grass.	mountain-ash M red elderberry M cow-parsnip M grasses M angelica L-M	HA	this unit has abundant grizzly bear forage, particularly on the moister lower slopes of the unit. The steep part of this unit may have small amounts of bear forage including red raspberry, black twinberry, grasses, sweet-cicely, glacier lily and springbeauty; The meadows at the base of this unit may have variable amounts of bear forage including red elderberry, red raspberry, mountain-ash, and sedges; forage species sometimes found and abundant when present include alder-leaved buckthorn and black twinberry.

ESSFa - Dry Southern, Cordilleran, Forested Engelmann Spruce - Subalpine Fir (continued)

Habitat Unit Name and Symbol	Physical Description	Vegetation		Grizzly Bear Use	Comments
		Successional Trends	Forage Potential		
2. DF Douglas-fir - Idaho fescue, shallow soils DF1	steep, southeast to west facing slopes of shallow soils developed from colluvial or morainal material; droughty sites, low moisture availability.	grass dominated cover of saskatoon, Douglas maple, Idaho fescue, gooseberry, bluebunch wheatgrass, arrow-leaved balsamroot, pussytoes.	little	LA	grouseberry may dominate at higher elevations of this unit; in southern parts of the study area, big sagebrush may be common (Kishnena Valley only); forage plants that may be present in small amounts include peavine, kinnikinnick, soopolallie, glacier lily, strawberry and angelica; very slow rate of succession; trees will only slowly invade these sites after disturbance; Idaho fescue and bluebunch wheat-grass may be less common in northern parts of the study area where grouseberry may dominate; lodgepole pine may be common.
DF2		pole-sapling, open forests of Douglas-fir, whitebark pine, Douglas maple, saskatoon, Idaho fescue, grouseberry, bluebunch wheatgrass, arrow-leaved balsamroot.	little	LA	
DF3		young open forests of Douglas-fir, whitebark pine, Douglas maple, saskatoon, grouseberry, Idaho fescue, bluebunch wheatgrass, pinegrass.	tree bark M	LA	
DF4		mature open forests of Douglas-fir, whitebark pine, subalpine fir, Douglas maple, Idaho fescue, grouseberry, pine-grass	tree bark M	LA	

ESSFa - Dry Southern, Cordilleran, Forested Engelmann Spruce - Subalpine Fir (continued)

Habitat Unit Name and Symbol	Physical Description	Vegetation		Grizzly Bear Use	Comments
		Successional Trends	Forage Potential		
3. FA Subalpine fir - false azalea mesic FA1	generally found on deep soils developed from morainal or colluvial materials; on cool aspects or on gentle to moderate slopes of all aspects; may be found on shallow soils of cool aspects.	shrub dominated cover of false azalea, Sitka alder, black huckleberry, arnicas, grouseberry, low bilberry, bear-grass, fireweed, pearly everlasting.	black huckleberry L-M low bilberry L-M mountain-ash L red elderberry L	LA	extensive unit; low bear food availability in all successional stages although berries are more common after disturbance; small amounts of red raspberry and cow-parsnip may be present (black huckleberry includes both Vaccinium membranaceum and V.globulare with V.membranaceum being more common)
FA2		pole-sapling forests of subalpine fir, false azalea, black huckleberry, arnicas, grouseberry, low bilberry, bear-grass, moderate to dense moss layer	mountain-ash L red elderberry L	LA	
FA3		young forests of subalpine fir, false azalea, black huckleberry, arnicas, grouseberry, low bilberry, bear-grass, moderate to dense moss layer.	mountain-ash L red elderberry L	LA	
FA4		mature forests of subalpine fir, Engelmann spruce, false azalea, black huckleberry, arnicas, dwarf blueberry, low bilberry, bear-grass, moderate to dense moss layer.	mountain-ash L red elderberry L	LA	

ESSFa - Dry Southern, Cordilleran, Forested Engelmann Spruce - Subalpine Fir (continued)

Habitat Unit Name and Symbol	Physical Description	Vegetation		Grizzly Bear Use	Comments
		Successional Trends	Forage Potential		
4. HB Black huckleberry - bear-grass, southerly aspect HB1	moderately steep to steep southeast to west facing slopes with high solar radiation; usually on deep soils developed from colluvial or morainal material.	shrub-forb cover of black huckleberry, bear-grass, grouseberry, low bilberry, fireweed, pearly everlasting.	black huckleberry M-H low bilberry L-H grouseberry L-H mountain-ash L red elderberry L	HF	black huckleberry berry production is best in early stages of succession particularly after severe or repeated fires have removed conifer seed sources and allow plenty of light to the shrubs, however the first few years after disturbance may have low berry production; black huckleberry may take up to 10 years to reestablish after severe disturbance; slow rate of succession, may stay unforested for long periods. (black huckleberry includes both Vaccinium membranaceum and V.globulare with V. membranaceum being more common)
HB2		pole-sapling, open forests of lodgepole pine, black huckleberry bear-grass, grouseberry, low bilberry	black huckleberry M-H low bilberry L-H grouseberry L-H mountain-ash L red elderberry L	HF	
HB3		young open to closed forests of subalpine fir, lodgepole pine, false azalea, black huckleberry, bear-grass, grouseberry, low bilberry	black huckleberry L-H mountain-ash L red elderberry L	HF	
HB4		mature open to closed forests of subalpine fir, Engelmann spruce, false azalea, black huckleberry, bear-grass, grouseberry, low bilberry	black huckleberry L-H mountain-ash L red elderberry L	HF	
5. RO Rock	areas of bed rock or talus	sparsely vegetated areas with pioneering vegetation.	nil	N	

ESSFa - Dry Southern, Cordilleran, Forested Engelmann Spruce - Subalpine Fir (continued)

Habitat Unit Name and Symbol	Physical Description	Vegetation		Grizzly Bear Use	Comments
		Successional Trends	Forage Potential		
6. SH Spruce - horsetail moist floodplain SH1	low terraces of creeks and rivers subject to moist conditions with rare flooding; moderately well to imperfectly drained soils developed from fluvial materials	lush shrub-herb cover of alder, black twinberry, black gooseberry, horsetails, western meadow-rue, grasses	grasses M horsetails M black twinberry L-M cow-parsnip M angelica L-M sedges L	HSpS	variable unit; forage species which may be present in small amounts include; mountain-ash, red elderberry, hawthorn, alder-leaved buckthorn, red raspberry, soopolallie, highbush-cranberry, wild strawberry, sweet-cicely, vetch and peavine, mature forests may have sparse understories; red-osier dogwood is frequently found in this unit; severe disturbance may create grass dominated areas; the SH1 stage may be very sparsely vegetated; deeper snow and a shorter growing season than in the HSa subzone.
SH2		pole-sapling forests of spruce, black twinberry, black gooseberry, horsetails, western meadow-rue, grasses	horsetails M grasses M black twinberry L-M cow-parsnip L-M angelica L sedges L	HSpS	
SH3		young forest of spruce, black twinberry, black gooseberry, horsetails, western meadow-rue, grasses	horsetails M tree bark M black twinberry L-M cow-parsnip L-M grasses L-M angelica L sedges L	HSpS	
SH4		mature forests of spruce, black twinberry, black gooseberry, horsetails, western meadow-rue, grasses	horsetails M tree bark M black twinberry L-M cow-parsnip L-M grasses L-M angelica L sedges L	HSpS	

ESSFa - Dry Southern, Cordilleran, Forested Engelmann Spruce - Subalpine Fir (continued)

Habitat Unit Name and Symbol	Physical Description	Vegetation		Grizzly Bear Use	Comments
		Successional Trends	Forage Potential		
7. SS Saskatoon - wild strawberry dry avalanche chute	steep sloped areas subject to snow avalanching in winter; usually on southerly and westerly aspects; usually shallow soils with some rock outcrops.	disturbance climax of sparse shrub-dominated vegetation of trembling aspen, willows, saskatoon, wild strawberry, asters	wild strawberry M grasses M saskatoon L-M	MA	quite variable vegetation; the steeper portions may have sporadic occurrences of the following forage species: black huckleberry, soopolallie, alder-leaved buckthorn and grasses; the base of the chutes may have black twinberry, mountain-ash, red elderberry and angelica; upper areas of these chutes may have good black huckleberry production; the shrub and herb layers of this unit are usually sparse.
8. WS Willow - sedge fen	depressional areas with organic deposits; high water table much of growing season	fen vegetation of willows, sedges, moss	sedges M	MS	willows may be absent; associated sites may have horsetails, angelica, black twinberry and alder-leaved buckthorn.

3.3 ATf - Dry, Southern, Cordilleran Alpine Tundra

Habitat Unit Name and Symbol	Physical Description	Vegetation		Grizzly Bear Use	Comments
		Successional Trends	Forage Potential		
1. AT Alpine tundra	usually shallow soils developed from colluvial material; variable aites, generally with well to rapidly drained soils	lower elevations may have sparse krummholz areas of alpine larch, subalpine fir, whitebark pine, grouseberry, bluegrass, mountain-avens, mountain-heather	sedges M forbs M	MS	alpine tundra is dry and sparsely vegetated in this area with little bear forage.
2. RO Rock	areas of bedrock or talus	sparsely vegetated areas with pioneering vegetation	nil	N	dominant area of the Alpine Tundra Zone.

CHAPTER 4. CORRELATION OF HABITAT UNITS TO OTHER STUDIES

This section compares some other methods of habitat classification with that presented here. Correlation tables show how the various categories given in other studies compare (approximately) to the habitat units used in the Flathead pilot project.

Ash (1985) described grizzly bear habitat components of the Flathead and Kootenay National Forests (Table 4.1). Habitat Components are mapped at detailed scales with a high degree of ground checking and reliability. This method of mapping would provide good information for location of hiking trails, campsites and similar detailed applications. It could not be used for the general level of planning described in the present methodology for several reasons. In mapping Habitat Components only important areas of habitat are mapped with most of the area remaining unmapped. Areas of low importance cannot be separated from areas of no importance, which is necessary for a carrying capacity calculation. More importantly, the Habitat Components are not based on soil or site factors and are therefore difficult to inter-relate or use in a predictive manner. For instance, areas with berry potential, which are currently unimportant because of their seral stage or site history, are not shown. A potential carrying capacity estimate could not be made for this reason. Current carrying capacity estimates might be possible with the information generalized to a smaller map scale, but higher density estimates might be needed because of the high degree of stratification. The Habitat Component method may also be inappropriate for British Columbia because of the great effort required to produce these large scale maps.

Pfister *et al.* (1977) described forest Habitat Types for Montana (Table 4.2). These are more general in nature than those used in the present study area, but they could be adapted to serve the purpose if made more specific to grizzly bear habitat. For instance, alpine and edaphic categories, such as avalanche tracks, wetlands, and rock, are not described. In addition, potential and present seral stages need to be described.

Utzig *et al.* (1983) described forest Ecosystem Associations for the Nelson Forest Region (Table 4.3), but these are not mapped. As with the classification of Pfister *et al.* (1977), these categories are often too general to describe grizzly bear habitat adequately. Again, alpine and edaphic categories, such as wetlands, avalanche tracks, rock and floodplains, are not described. In addition, seral stages need to be described. While inadequate as the habitats are presently described, this system could be adapted to produce a good habitat map and calculate carrying capacity.

Table 4.1 Correlation to Habitat Components

Habitat Units (Present Study)	Habitat Components (Ash 1985)
AH Sitka alder - Indian hellebore avalanche chute	Alder shrub field Open snowchute
AT Alpine tundra	none
DF1 Douglas-fir - Idaho fescue shallow soils, southerly aspect	Graminoid Side Hill Park
DF2 " "	Graminoid Side Hill Park
DF3 " "	none
DF4 " "	none
FA1 Subalpine fir - false azalea mesic	Mixed Shrubfield/Burn/Cutting Unit
FA2 " "	Timbered Huckleberry Shrubfield
FA3 " "	Timbered Huckleberry Shrubfield
FA4 " "	Timbered Huckleberry Shrubfield
GB Gravel bars	none
GF Grassy fields	none
HB1 Black huckleberry - bear-grass southerly aspect	Huckleberry Shrubfield
HB2 " "	Mixed Shrubfield/Burn/Cutting Unit
HB3 " "	Timbered Huckleberry Shrubfield
HB4 " "	Timbered Huckleberry Shrubfield Timbered Huckleberry Shrubfield
LF1 Lodgepole pine - falsebox southerly aspect	Mixed Shrubfield/Burn/Cutting Unit
LF2 " "	Timbered Buffalo-berry Shrubfield
LF3 " "	Timbered Buffalo-berry Shrubfield
LF4 " "	Timbered Buffalo-berry Shrubfield
LP1 Lodgepole pine - pinegrass coarse fluvial	Mixed Shrubfield/Burn/Cutting Unit
LP2 " "	Timbered Buffalo-berry Shrubfield
LP3 " "	Timbered Buffalo-berry Shrubfield
LP4 " "	None
LM1 Lodgepole pine - pinegrass morainal	Mixed Shrubfield/Burn/Cutting Unit
LM2 " "	Timbered Buffalo-berry Shrubfield
LM3 " "	Timbered Buffalo-berry Shrubfield
LM4 " "	None
RO Rock	Rock
SH Spruce - horsetail moist floodplain	Riparian Stream Bottom
SS Saskatoon - wild strawberry dry avalanche chute	none
WC Willow - cow-parsnip active floodplain	Riparian Stream Bottom
WS Willow - sedge fen	Wet Meadows

Table 4.2 Correlation to Habitat Types

Habitat Units (Present Study)	Habitat Types (Pfister et al. 1977)
AH Sitka alder - Indian hellebore avalanche chute	none
AT Alpine tundra	Alpine larch - subalpine fir
DF1 Douglas-fir - Idaho fescue shallow soils, southerly aspect	none
DF2 " "	none
DF3 " "	none
DF4 " "	Whitebark pine
FA1 Subalpine fir - false azalea mesic	none
FA2 " "	none
FA3 " "	none
FA4 " "	Subalpine fir - false azalea
GB Gravel bars	none
GF Grassy fields	none
HB1 Black huckleberry - bear-grass southerly aspect	none
HB2 " "	none
HB3 " "	none
HB4 " "	Subalpine fir - bear-grass (globe huckleberry phase)
LF1 Lodgepole pine - falsebox southerly aspect	none
LF2 " "	none
LF3 " "	none
LF4 " "	none
LP1 Lodgepole pine - pinegrass coarse fluvial	none
LP2 " "	none
LP3 " "	none
LP4 " "	Subalpine fir - dwarf blueberry
LM1 Lodgepole pine - pinegrass morainal	none
LM2 " "	none
LM3 " "	none
LM4 " "	Subalpine fir - dwarf blueberry
RO Rock	none
SH Spruce - horsetail moist floodplain	Spruce - common horsetail
SS Saskatoon - wild strawberry dry avalanche chute	none
WC Willow - cow-parsnip active floodplain	none
WS Willow - sedge fen	none

Table 4.3 Correlation to Ecosystem Associations

Habitat Units (Present Study)	Ecosystem Associations (Utzig. et al. 1983)
AH Sitka alder - Indian hellebore avalanche chute	none
AT Alpine tundra	none
DF1 Douglas-fir - Idaho fescue shallow soils, southerly aspect	none
DF2 " "	none
DF3 " "	none
DF4 " "	Juniper - pine grass (ESSFa/02)
FA1 Subalpine fir - false azalea mesic	none
FA2 " "	none
FA3 " "	none
FA4 " "	False azalea - few-flowered wintergreen (ESSFa/01)
GB Gravel bars	
GF Grassy fields	
HB1 Black huckleberry - bear-grass southerly aspect	none
HB2 " "	none
HB3 " "	none
HB4 " "	none
LF1 Lodgepole pine - falsebox southerly aspect	none
LF2 " "	none
LF3 " "	none
LF4 " "	Juniper-kinnikinnick (MSa/03)
LP1 Lodgepole pine - pinegrass coarse fluvial	none
LP2 " "	none
LP3 " "	none
LP4 " "	Soopolallie - pinegrass (MSa/04)
LM1 Lodgepole pine - pinegrass morainal	none
LM2 " "	none
LM3 " "	none
LM4 " "	Soopolallie - pinegrass (MSa/04)
RO Rock	none
SH Spruce - horsetail moist floodplain	Black twinberry - horsetail (MSa/06)
SS Saskatoon - wild strawberry dry avalanche chute	none
WC Willow - cow-parsnip active floodplain	none
WS Willow - sedge fen	Bog birch - sedge (MSa/07)

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